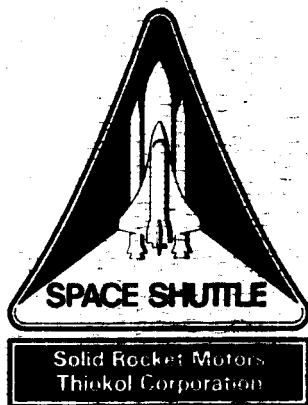


TWR-19907



7U76976-01 Transducer Assembly Proof and Vibration Final Test Report

(NASA-CR-183785) THE 7U76976-01 TRANSDUCER
ASSEMBLY PROOF AND VIBRATION FINAL TEST
REPORT (Morton Thiokol) 30 p

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7U76976-01 Transducer Assembly Proof and Vibration
Final Test Report

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ABSTRACT

The structural and sealing integrity of the 7U76975-01 Adapter when used in the 7U76976-01 Transducer Assembly has been verified. The transducer assembly has satisfactorily passed the vibration/pressure test per WTP-0190 and is acceptable for use on the TEM-4 test article.

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INTRODUCTION

The purpose of this test was to verify the structural and sealing integrity of the 7U76975-01 Adapter when used in the 7U76976-01 Transducer Assembly. The 7U76976 Transducer Assembly is used to measure pressure between the barrier-booster (B-B) rotor O-rings.

1.1 TEST ITEM DESCRIPTION

One 7U76976-01 was subjected to all phases of the test. The assembly uses a Teledyne-Tabor Model 2210-3000 Pressure Transducer which is rated for 3,000 psi. The 7U76975-01 Adapter is also part of the assembly. During all phases of testing where the 7U76976 was pressurized, the test fixture (4U133541) mating port was in accordance with MS33649-01 and was constructed of Type 304, Condition A stainless steel. The port was gaged before and after use to verify that it met requirements.

The vibration test took place at the Thiokol Corporation T-53 vibration facility. All other testing took place at M-9.

The test item configuration was controlled by WTP-0190 and the applicable documents referenced in that document.

TEST OBJECTIVES

The developmental objectives for this test are as follows:

1. Verify that the 7U76976-01 Assembly does not leak or fracture during or following vibration loading specified in WTP-0190.
2. Determine if the 7U76976-01 remains operational following 150 percent of the maximum operational pressure.

3

SUMMARY/CONCLUSIONS

3.1 SUMMARY

One 7U76976-01 was subjected to all phases of the test. The assembly uses a Teledyne-Tabor Model 2210-3000 Pressure Transducer which is rated for 3,000 psi. The 7U76975-01 Adapter is also part of the assembly.

The transducer was vibrated in two axis directions for 7 g root mean square for six minutes. The 7U76976 Transducer was pressurized to 3,000 \pm 20 psig during the vibration test.

The 150 percent maximum pressure test was run and the transducer was functional during and after the test.

A leak check was then successfully performed per STW7-2853.

3.2 CONCLUSIONS

The following is a one-on-one correlation of development objectives with test results. Detailed results can be found in the sections referenced in parenthesis.

- | | |
|---|---|
| 1. Verify that the 7U76976-01 Assembly does not leak or fracture during or following vibration loading specified in WTP-0190. | The 7U76976-01 Assembly did not leak or fracture following vibration loading as evidenced by the successful 150 percent overpressure test. (Sec 6.1, 6.2) |
| 2. Determine if the 7U76976-01 remains operational following 150 percent of the maximum operational pressure. | The 7U76976-01 remained operational following 150 percent overpressure test as evidenced by the successful leak check performed (Sec 6.2, 6.3). |

It is concluded that the transducer assembly satisfactorily passed the vibration/overpressure test and is recommended for use.

INSTRUMENTATION

Standard laboratory equipment traceable to the National Institute of Standards and Technology (NIST) was used to support this test. All calibrated measuring and test equipment used to support this test was in accordance with MIL-STD-45662. All instruments were operationally verified before and after each test.

PHOTOGRAPHY

Photographic coverage, although required for the test, was not implemented.

TEST RESULTS AND DISCUSSION

6.1 RANDOM VIBRATION TEST

6.1.1 Introduction

A random vibration test was performed at T-53 to verify the structural integrity of the 7U76967-01 Transducer Assembly.

Each transducer was subjected to random vibration at 7 g root mean square for six minutes following the vibration criteria listed below (ref SE-019-049-2H). The 7U76976 Assembly was pressurized to 3,000 +20/-0 psig during the vibration test.

20 to 50 Hz	at	0.020 g ² /Hz
50 to 150 Hz	at	+3 dB/oct
150 to 500 Hz	at	0.060 g ² /Hz
500 to 2,000 Hz	at	-6 dB/oct
2,000 Hz	at	0.0038 g ² /Hz

The test was performed in the two axis directions (longitudinal and lateral).

6.1.2 Objectives

The vibration test was run to support the following test objective:

Verify that the 7U76976-01 Assembly does not leak or fracture during or following vibration loading specified in WTP-0190.

6.1.3 Results and Discussion

The vibration test verified the structural and sealing integrity of the transducer assembly. The 7U76976 Assembly was pressurized to 3,000 ±20 psig and maintained that pressure during the vibration test.

Vibration was recorded and verified by T-53 personnel to be within the criteria listed above. See Appendix A for vibration test data.

The gage was verified to be functional following this test during the 150 percent overpressure test documented in Section 6.2 of this report.

6.2 150 PERCENT MAXIMUM PRESSURE TEST

6.2.1 Introduction

Ten (10) volts dc input was applied to each pressure transducer. Pressure was increased in 200 psi increments to 4,500 psig for the transducer assembly. Pressure transducer voltage output versus time and lab standard pressure versus time were recorded.

6.2.2 Objectives

The 150 percent maximum pressure test was run to support the following test objectives:

1. Verify that the 7U76976-01 Assembly does not leak or fracture during or following vibration loading specified in WTP-0190.
2. Determine if the 7U76976-01 remains operational following 150 percent of the maximum operational pressure.

6.2.3 Results and Discussion

The transducer assembly remained functional for the duration of the test, and the reading returned to zero following the test (Figures 6.2.3-1 and 6.2.3-2). No leakage was noted.

6.3 LEAK CHECK TEST

6.3.1 Introduction

Following the 150 percent maximum pressure test, the transducer assembly was leak tested per STW7-2853.

6.3.2 Objectives

The leak check test was performed to support the following objective:

Determine if the 7U76976-01 remains operational following 150 percent of the maximum operational pressure.

6.3.3 Results and Discussion

The leak check test per STW7-2853 was successfully completed. The low pressure decay was 0.0 psi (2 psi max) and the high pressure decay was 1.0 psi (10 psi max). No anomalies were noted.

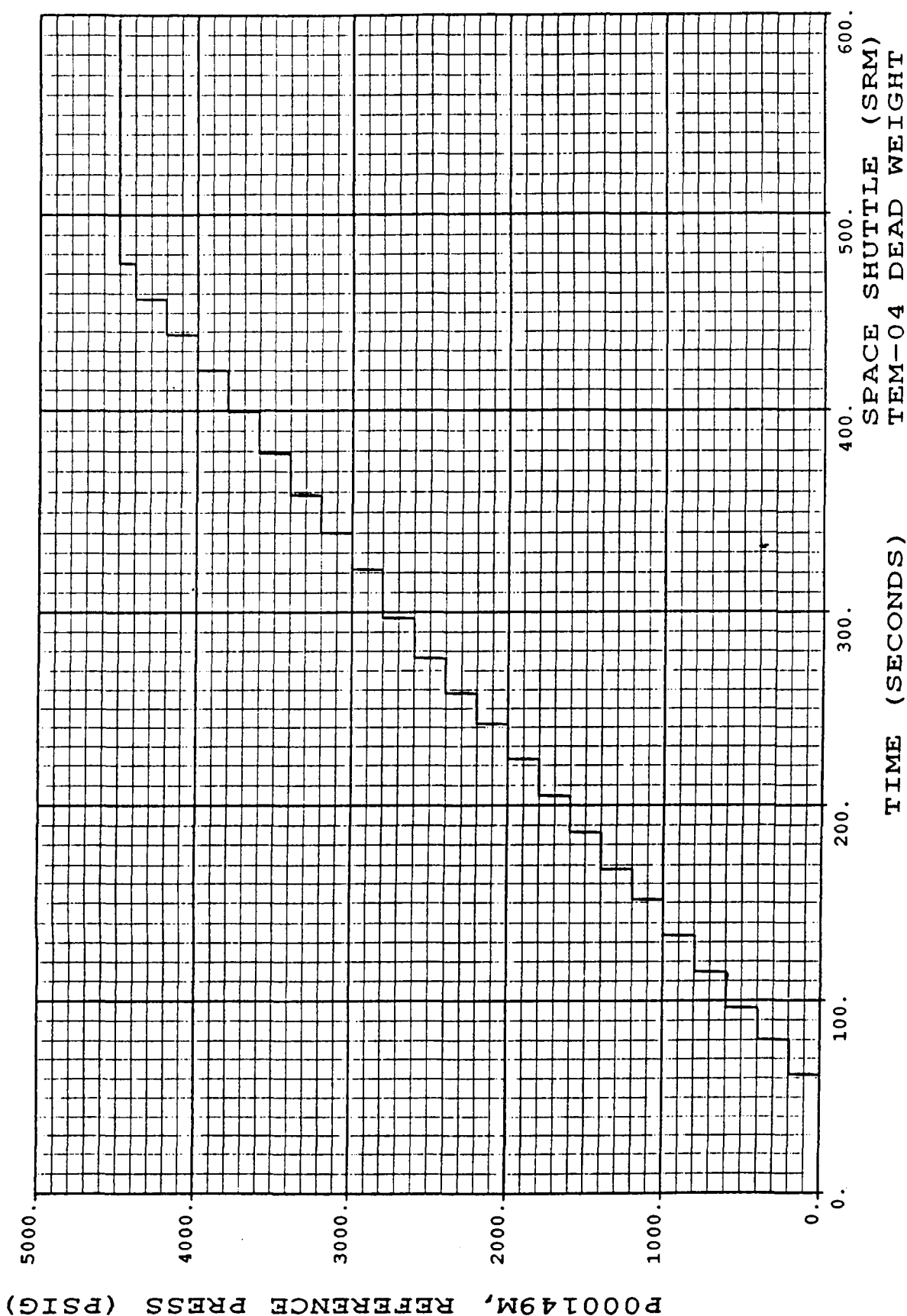


Figure 6.2.3-1. Transducer Test Results

P000149M, REFERENCE PRESS (PSIG)

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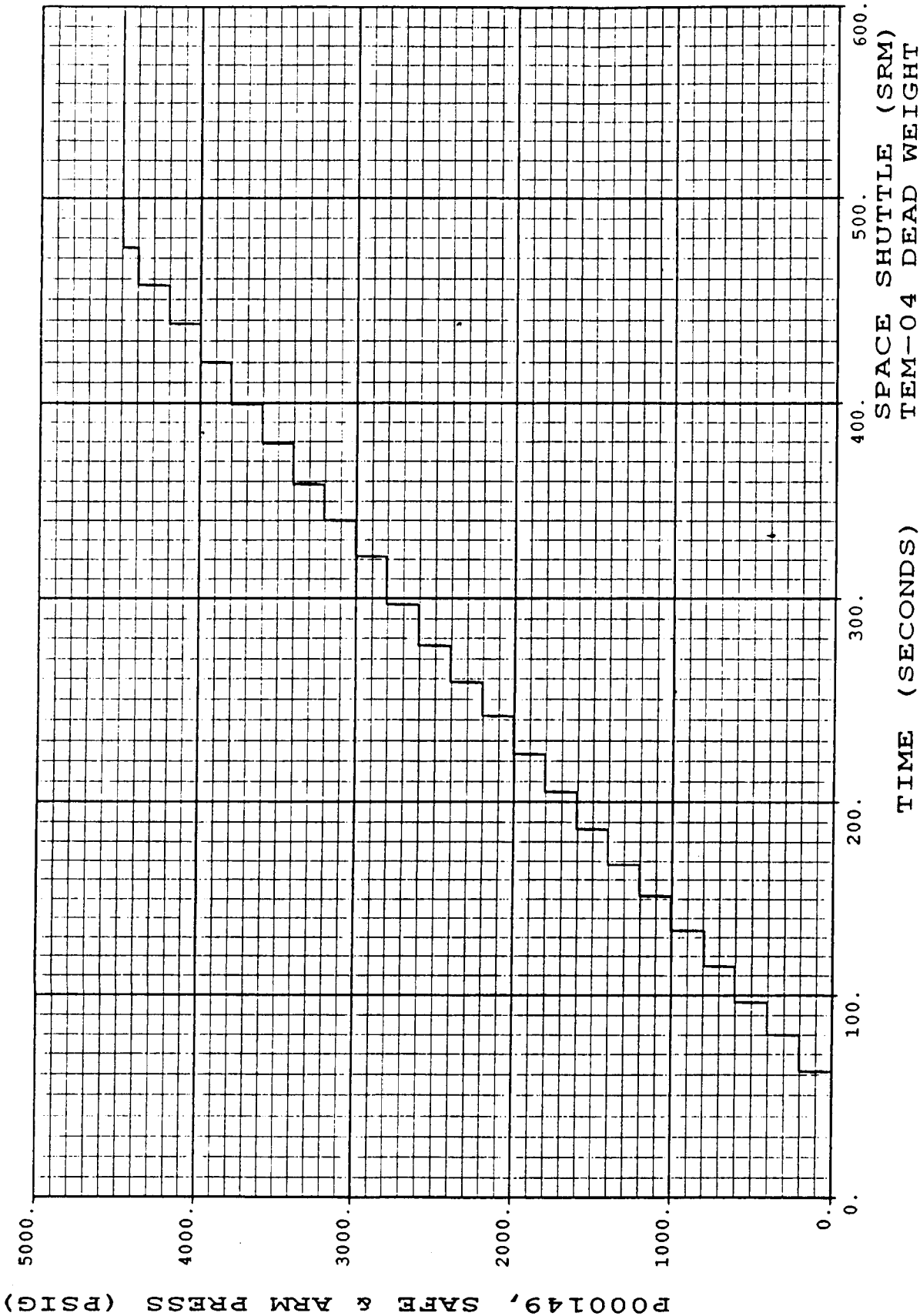


Figure 6.2.3-2. Transducer Test Results

SPACE SHUTTLE (SRM)
TEM-04 DEAD WEIGHT
S & A PRESS XDUCE
30 JUNE 1989

APPLICABLE DOCUMENTS

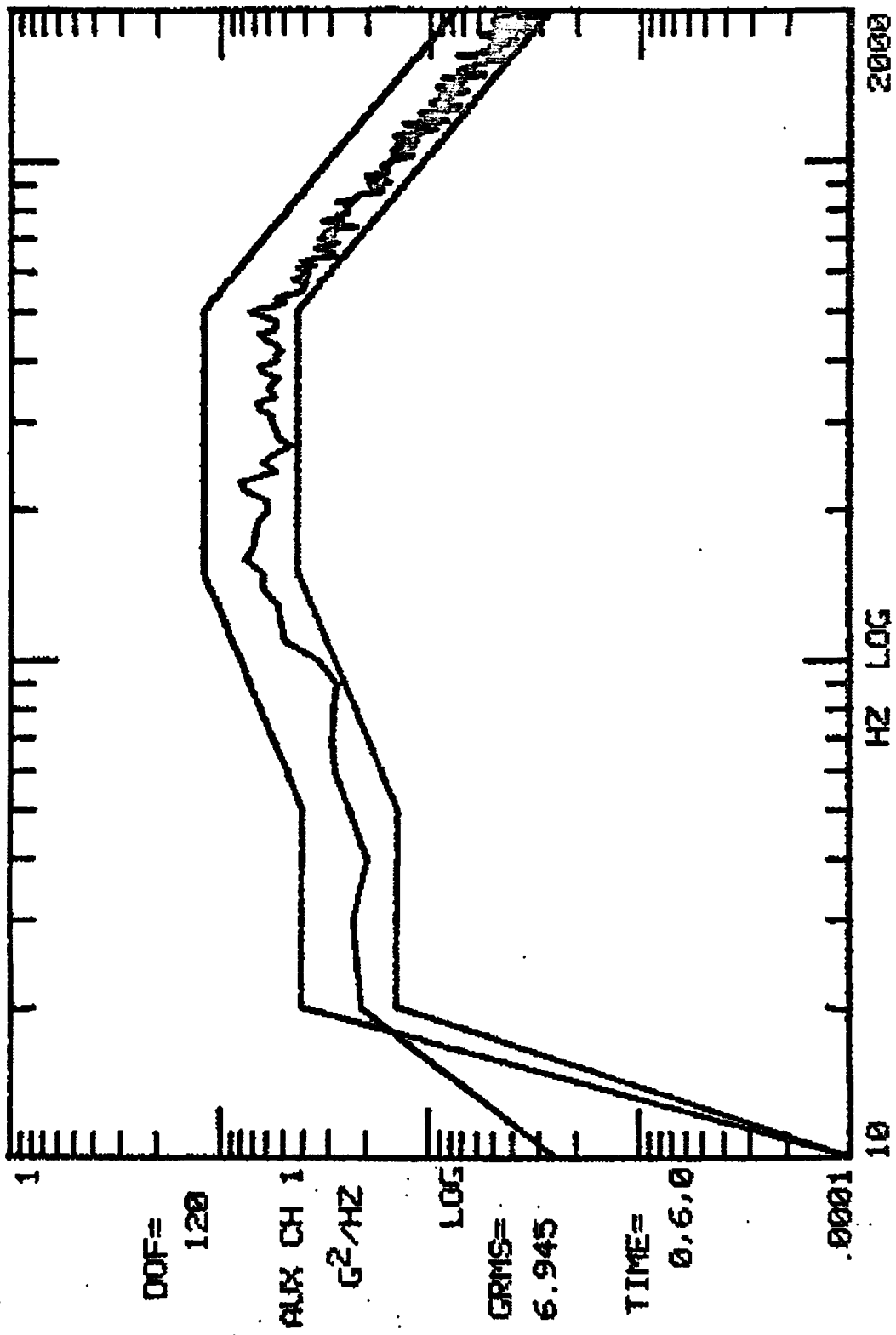
WTP-0190	7U76967-01 Transducer Assembly Proof and Vibration Test Plan
MIL-STD-45662	Calibration Systems Requirements
SE-019-049-2H	Solid Rocket Booster Vibration, Acoustic and Shock Design and Test Criteria
STW7-2853	Leak Test, Pressure Transducer Assemblies, Space Shuttle Project Solid Rocket Motor

Appendix A
Proof and Vibration Test

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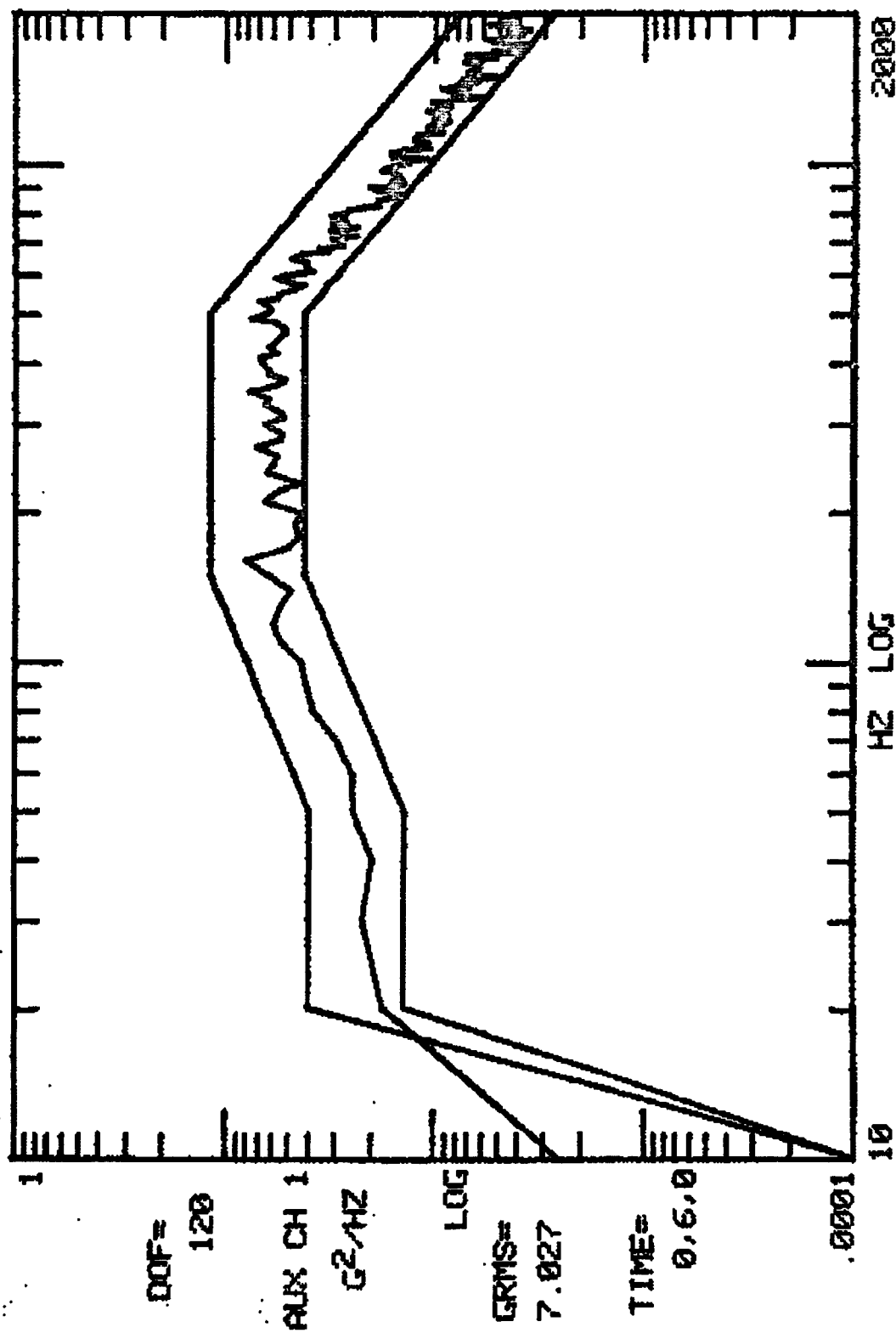
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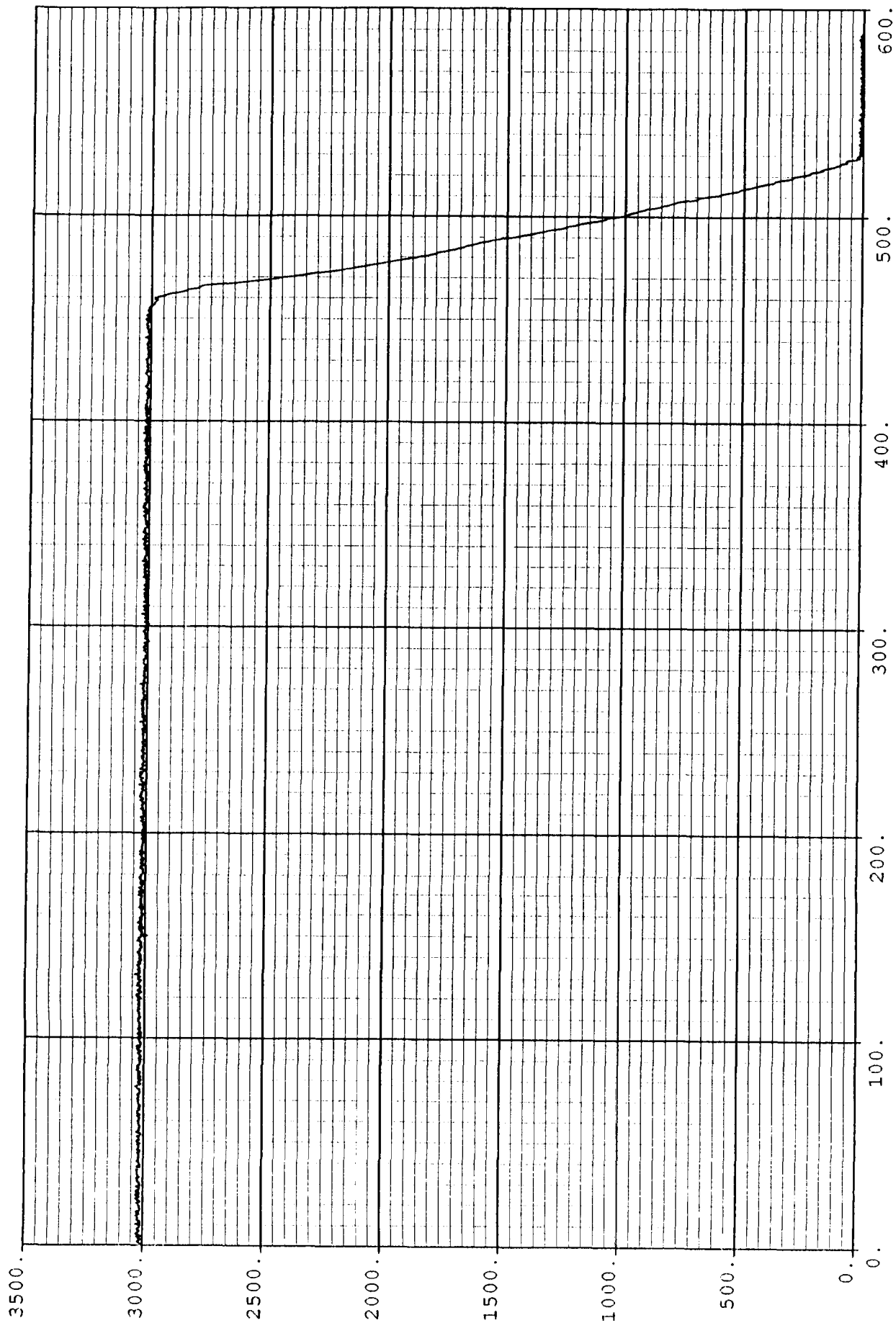
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22 AUG 1988

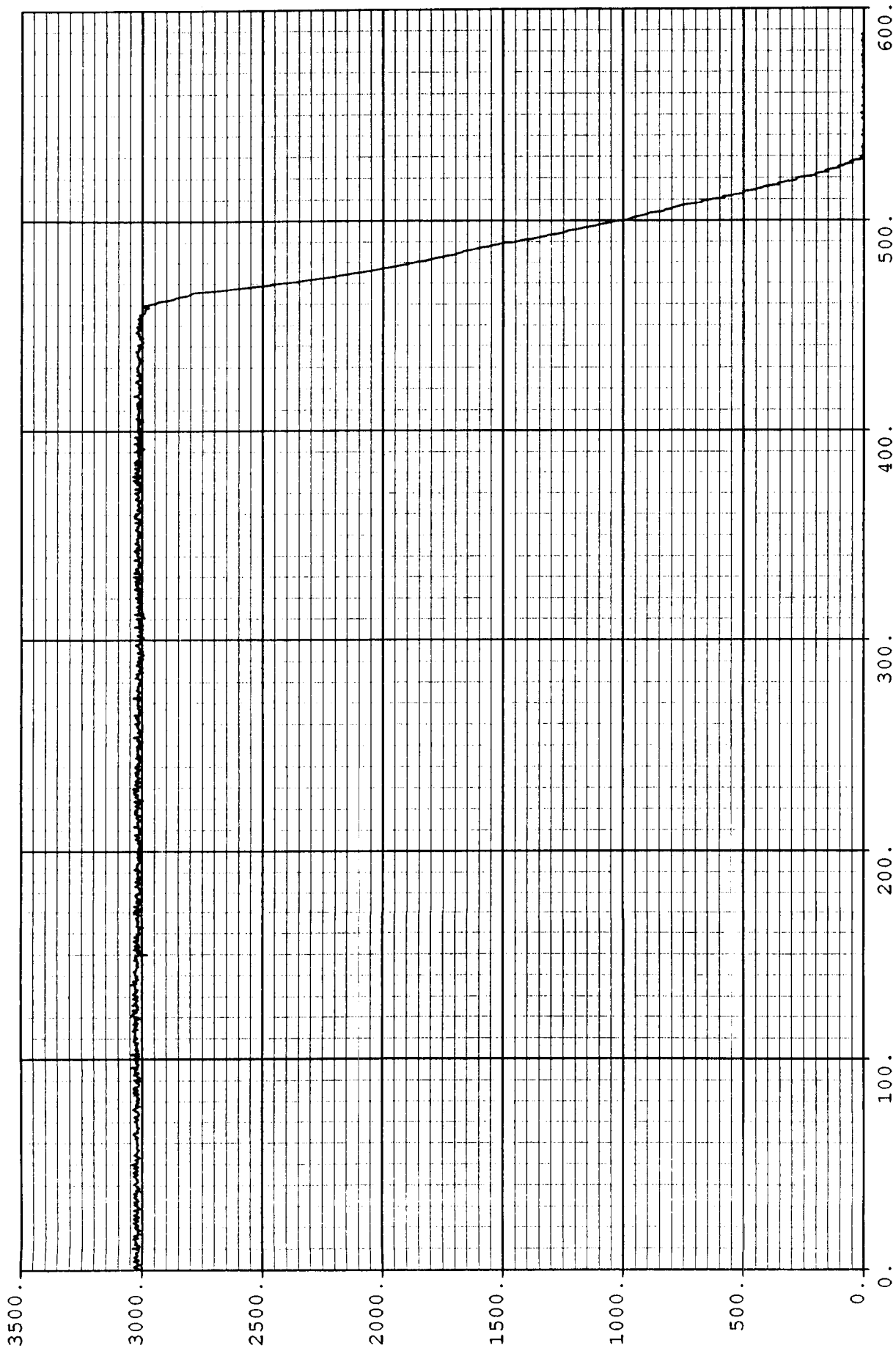
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A-4



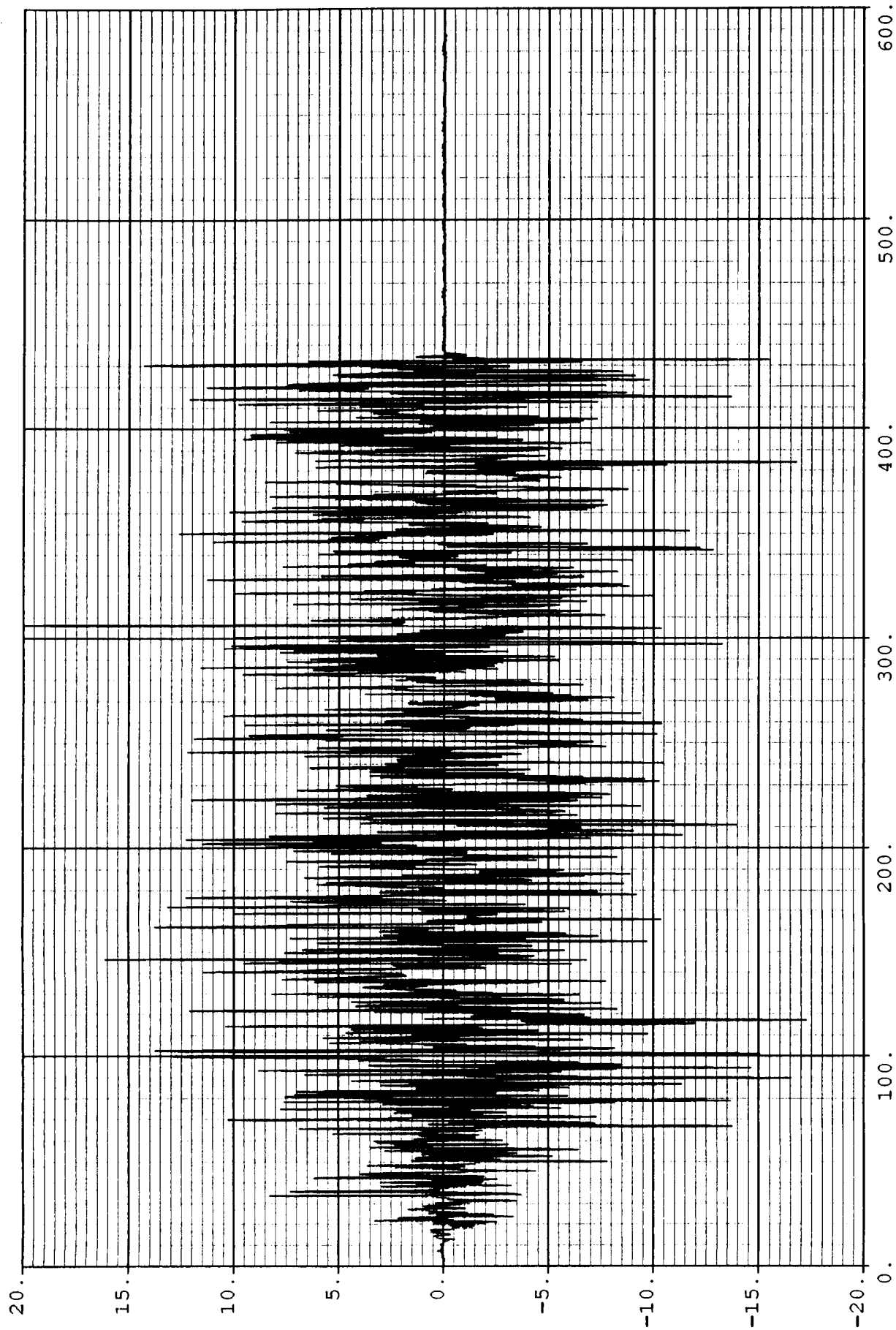
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7U76976-01 X-DUCER
PROOF & VIB ---LONG---
10 JULY 1989



SPACE SHUTTLE (RSRM)
7U76976-01 X-DUCER
PROOF & VIB --LONG--
10 JULY 1989

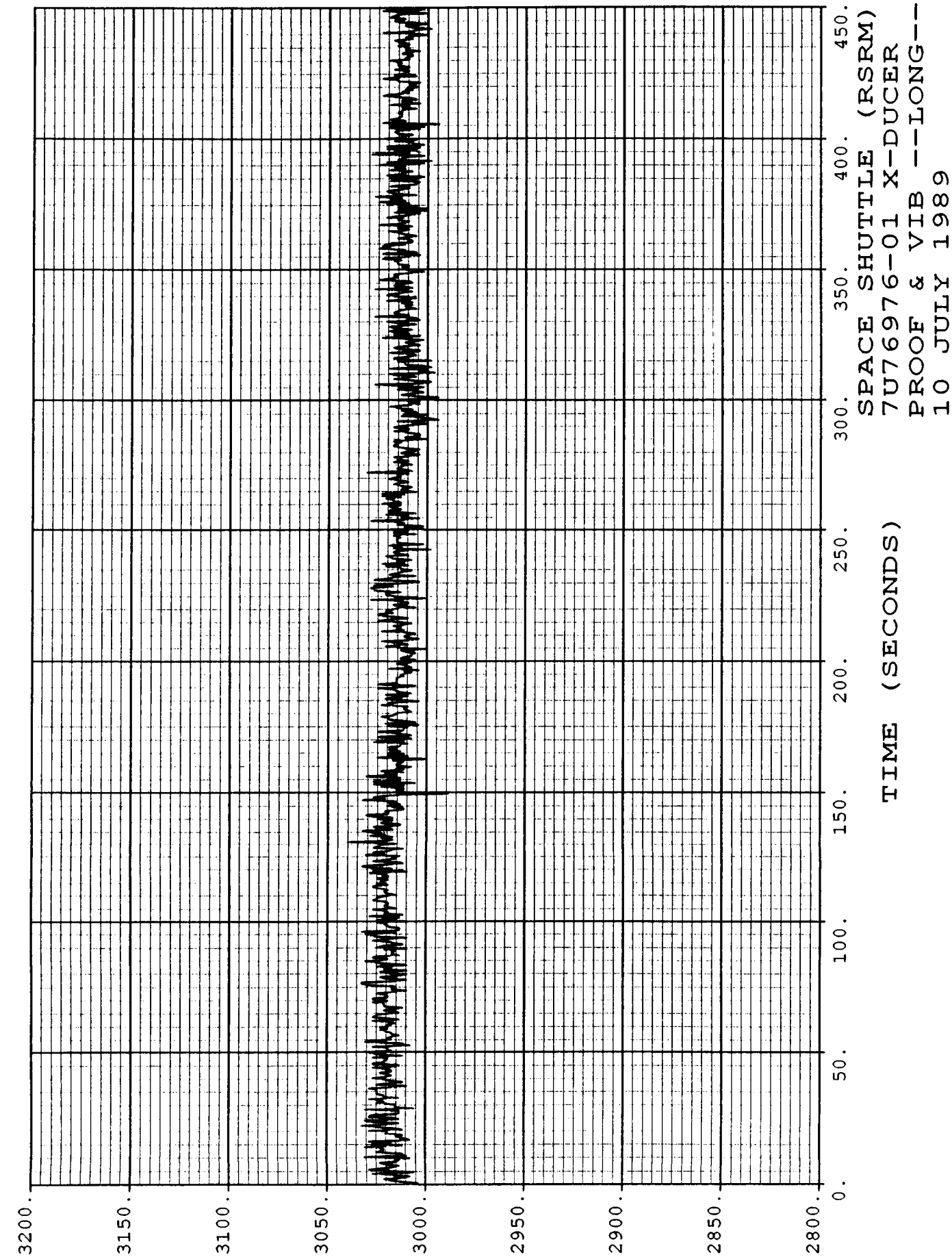
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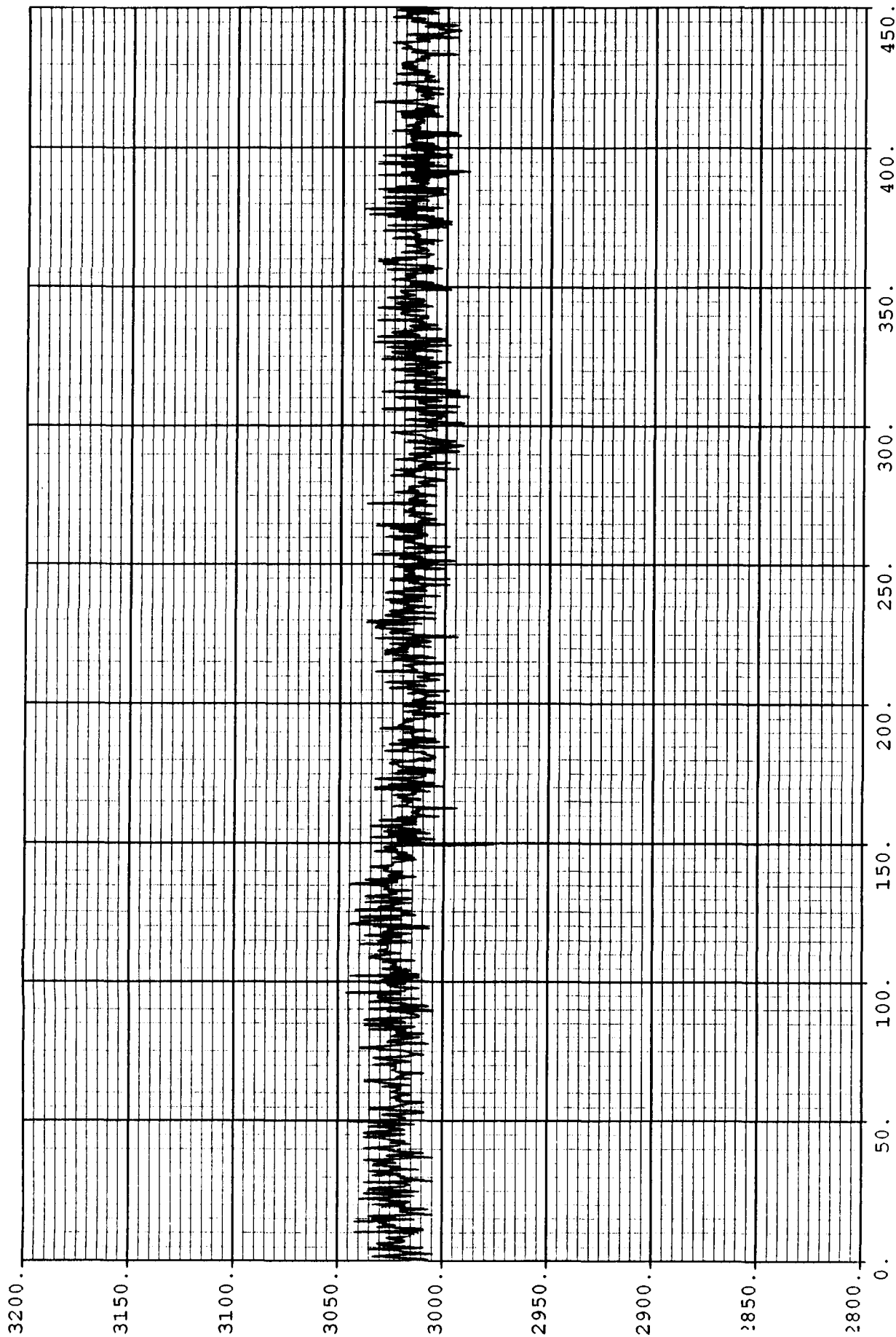


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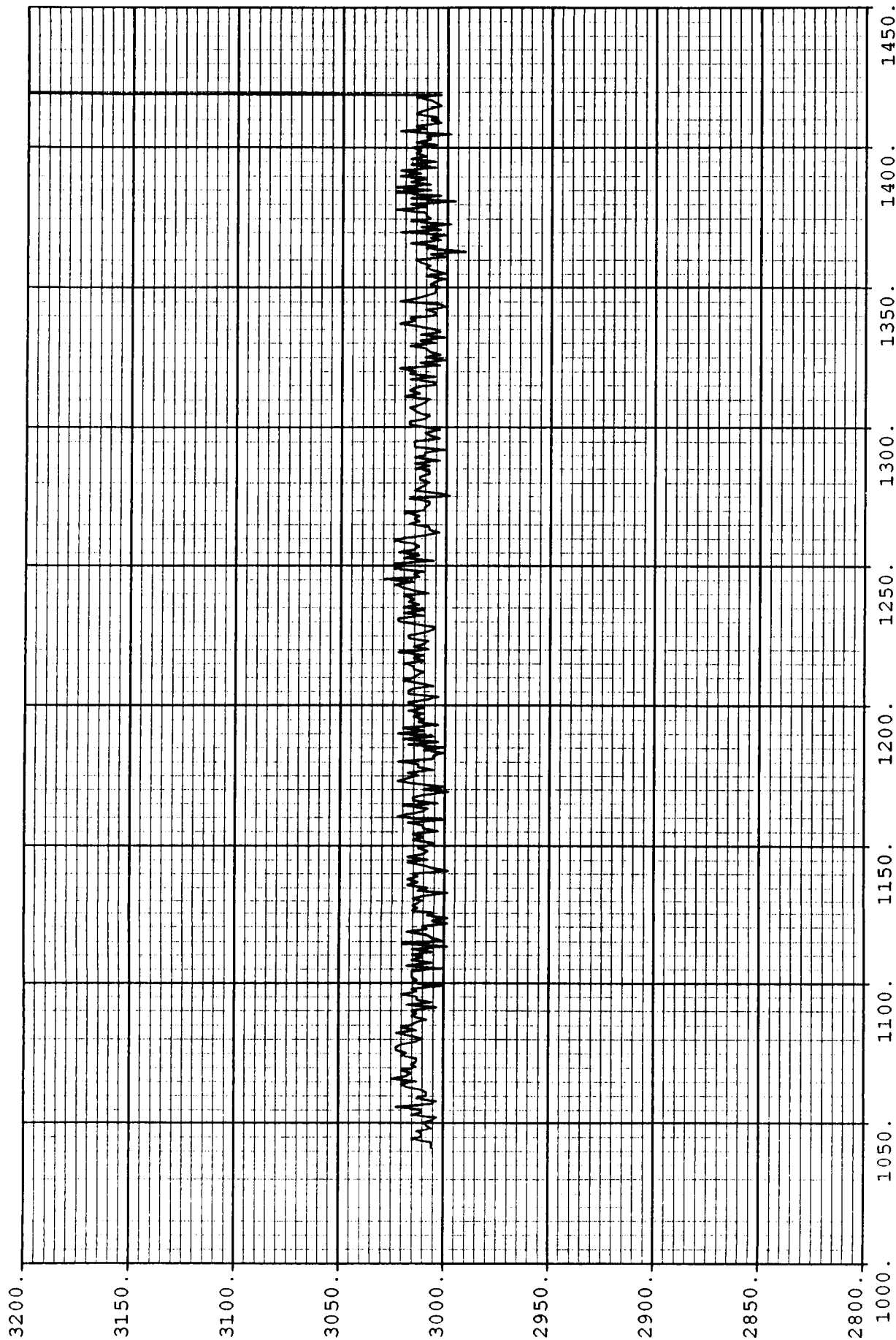




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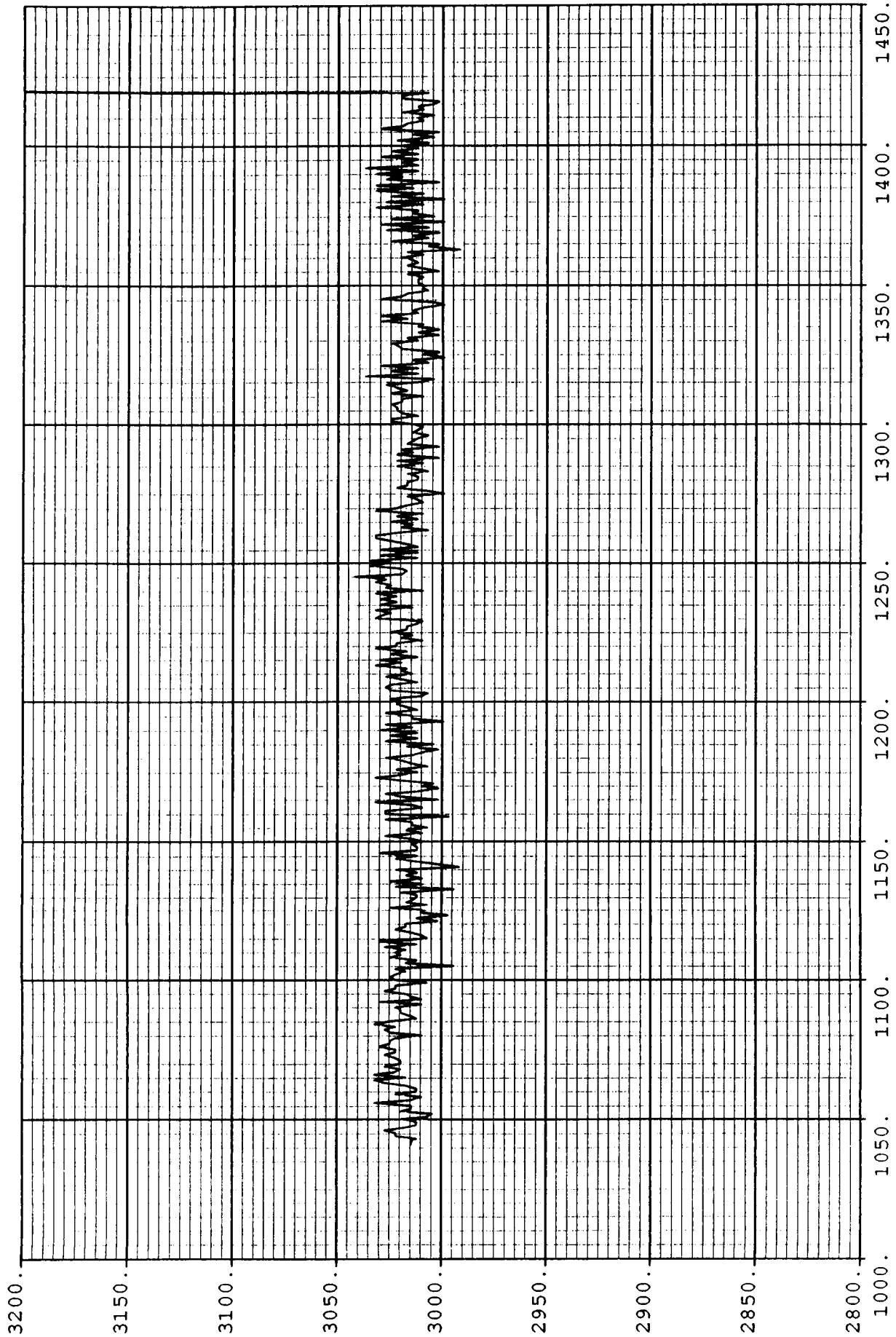
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7U76976-01 X-DUCER
PROOF & VIB ---LONG---
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P001, TABER 2210 S/N 862190 (PSI)



TIME (SECONDS)

SPACE SHUTTLE (RSRM)
7U76976-01 X-DUCER
PROOF & VIB --LATR--
6 JULY 1989

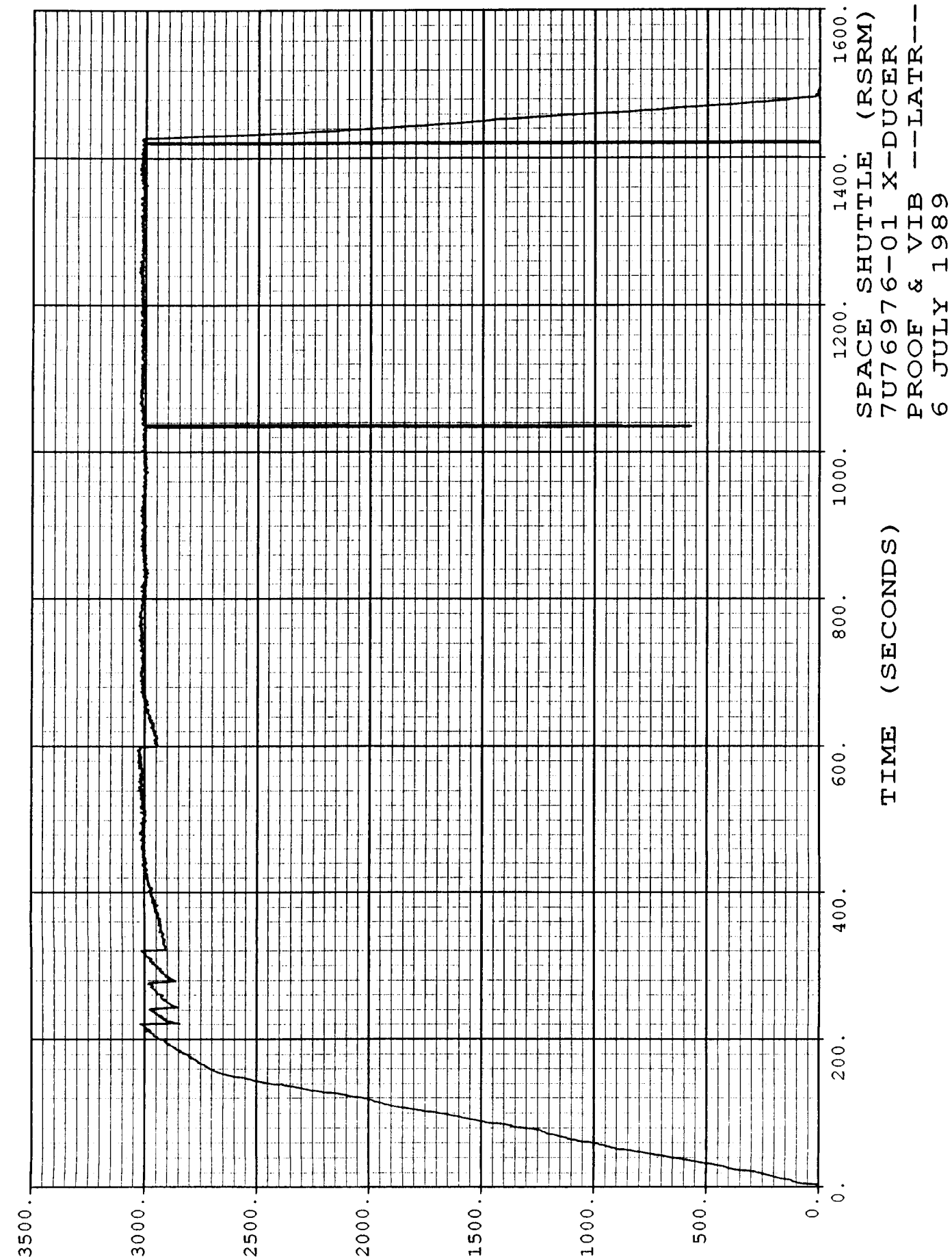


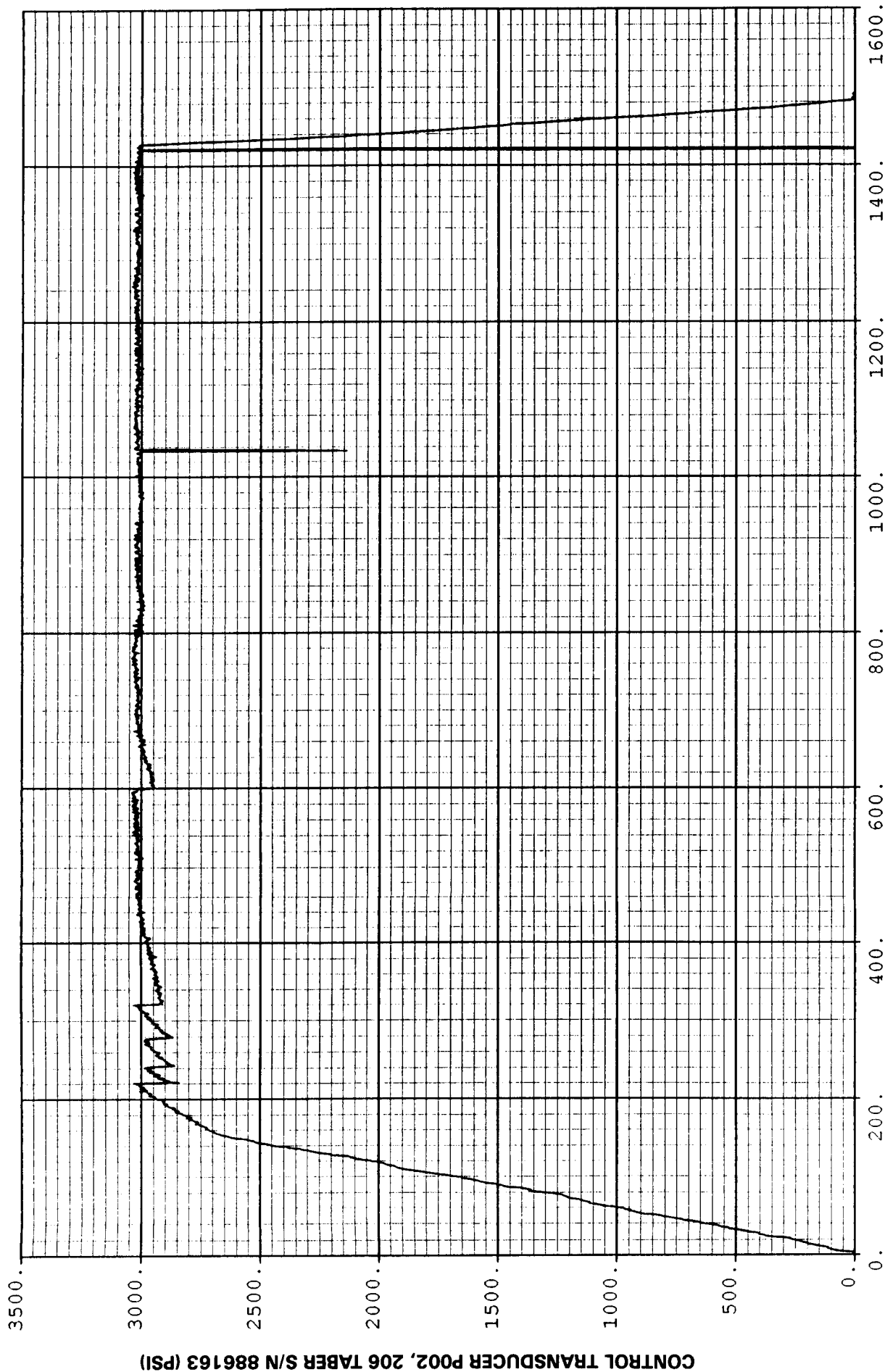
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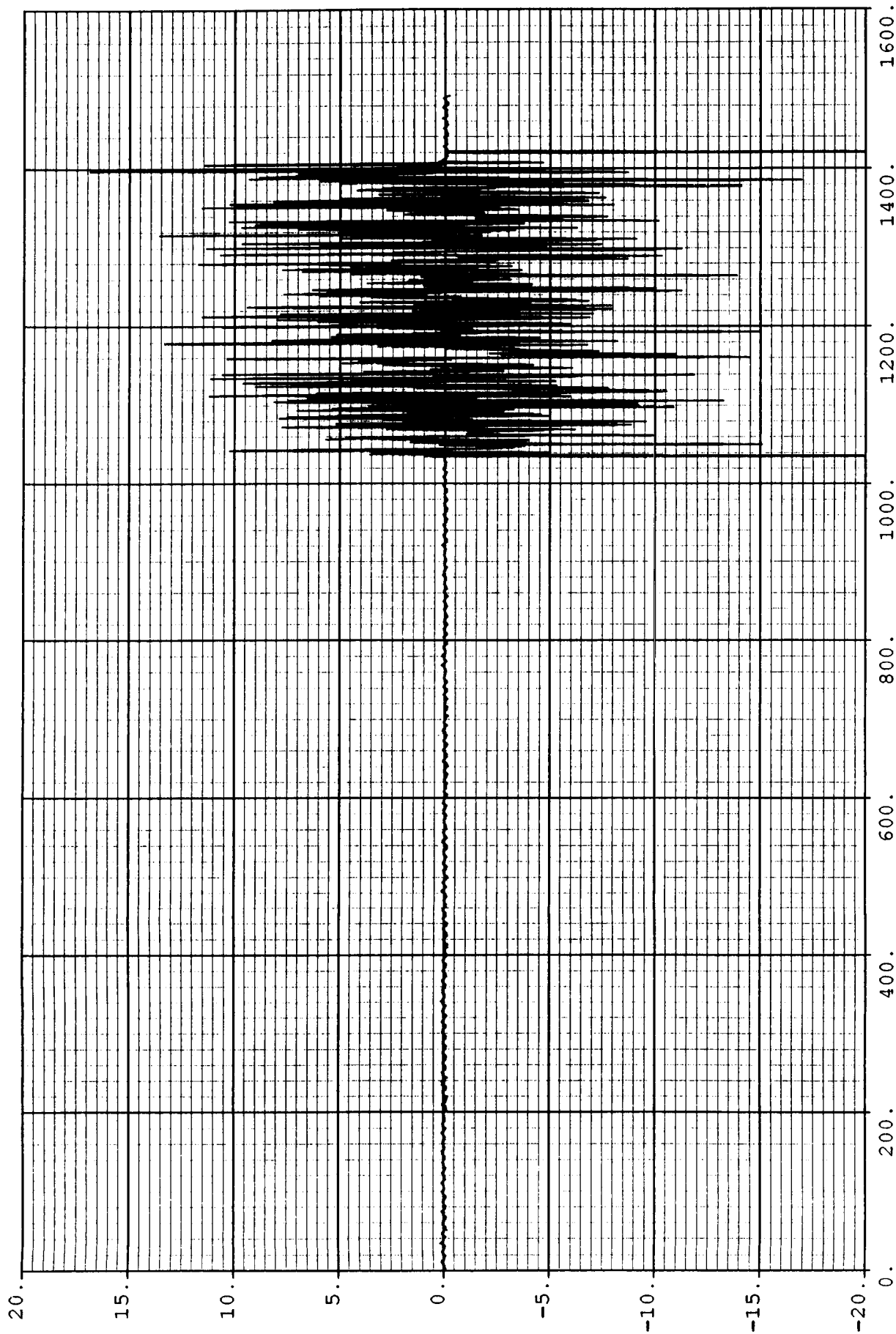
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SPACE SHUTTLE (RSRM)
7U76976-01 X-DUCER
PROOF & VIB --LATR--
6 JULY 1989

A001, CONTROL ACCELEROMETER (GS)



TIME (SECONDS)

SPACE SHUTTLE (RSRM)
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